

Trade and Income Distribution: The Validity of Stolper-Samuelson Theorem and Factor Price Equalization Theory

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Abstract: *The paper was assessing the relationship of trade and income distribution while validating the Stolper Samuelson and price factor theorem in practice. The study reviewed the several articles/journals about trade and wage distribution based on Stolper Samuelson theorem and price factor equalization theorem. The major findings show that, in practice, there is unclear evidence on relationship between trade and wage or income distribution. But no general and direct relationship between the trade and wages that holds in any general-equilibrium theory of trade. However, theoretical results with more than two factors, suggest that the determination of wages is not as simple as the Stolper-Samuelson theorem suggests. Wages and other factor prices depend not on trade per se but also on prices of goods. These in turn may be determined primarily in world markets, depending on the size of the country and under special additional assumptions they may even vary systematically with the quantities of trade. Moreover, various models relate wages to prices of goods rather than to trade. It is recommended that comprehensive reviews of studies should be done to explore the existence of relationship between trade and wage/income distribution.*

Keyword: *Factor, Income, Price, Trade, Wage*

1.0 Introduction

Globalization has not only increased the movement of labour and capital from one country to another but also brought concept of the price factor equalization in international trade (Feenstra, and Gordon, 1996). Perhaps the cornerstone of Samuelson's early trade work emerged from it. Thus, it is widely celebrated work of Samuelson Stolper in the world. The work was first demonstrated the "Heckscher Ohlin theorem" in a two good, two country, two factor model that focused on labour and capital. The H-O theorem confirmed that with identical technologies at home and abroad, the country with the larger endowment of labour relative to capital, it often export the labour intensive good (Deardorff, 1994). Considering the china, it has nearly 1.3 billion people making the country rich in labour force. Under such situation, china is expected to export labour and capital to any country as free trade opens up with other countries.

Through globalization, an increase of international trade and wage inequality have have created the interest in the empirical relevance of the Stolper-Samuelson theorem (Lawrence and Slaughter, 1993). Although a brilliant theoretical accomplishment, the Stolper-Samuelson theorem has received little empirical support. Leamer (1998) reported the mixed results partially because prices are endogenous in a large country. Robbins (1995) tried to establish the association of trade volume and relative wages in a small country. Similarly, Robertson (1999) shows that Mexico entered the GATT in 1986 and thus, it protected less skill intensive industries. It was observed, trade liberalization caused dramatic movements in goods and price among trading countries. This point out, the relative price of skill-intensive goods rose up, raising between-industry demand for skilled labour and relative wages of skilled labour (Liu et al, 1998). Liberalization has increased trade within and across countries on labour, capital and tradable goods. Leamer (1998) studied on linkage between trade and low wage in American industries. However, limited literature reveals that only a few empirical studies unambiguously support the predictions of the Stolper-Samuelson theorem and decrease in income inequality after trade liberalization. These include Wood (1994), Bourguignon and Morrisson (1990), Calderón and Chong (2001) and Dollar and Kraay (2004).

This paper assesses the relationship between trade and wages or income distribution with intention to validate the Stolper-Samuelson theorem and price factor equalization theorem. In attempting to fulfill the objective of this paper, we have come up with questions. Does theory has reality in practice? If yes, to what extent does theory shows relationship between trade and wage or income distribution? To answer these questions, the reviews of literatures were conducted to establish the empirical evidence on the relationship between trade and wage distribution, and its applicability in economy.

2.0 THEORETICAL FRAMEWORK**2.1 Stolper Samuelson Theorem**

The theorem states that an increase in the price of a good resulted into an increase in the price of factor used intensively in that industry and decreases in the price of the other factor. The Stolper-Samuelson theorem demonstrates how changes in prices of output affect the prices of factors when positive production and zero economic profit are maintained in each industry (Magee, 1980). It is useful in analyzing the effects on factor income, either when countries move from autarky to free trade or when tariffs or other government regulations are imposed within the context of a H-O model. Due to the assumption of perfect competition in all markets, if production occurs in an industry, then economic profit is driven to zero. The zero profit conditions in each industry implies,

$$P_S = a_{LS}w + a_{KS}r$$

$$P_C = a_{LC}w + a_{KC}r$$

Where P_S and P_C are the prices of steel and clothing respectively, w is the wage paid to labor and r is the rental rate on capital. The dollar payment to labours per ton of steel produced is given by

$$a_{LS}w \left[\frac{\text{labor-hrs}}{\text{ton}} \frac{\$}{\text{labor-hr}} = \frac{\$}{\text{ton}} \right]$$

The dollar payment to capital owners per ton of steel produced is given by

$$a_{KS}r \left[\frac{\text{capital-hrs}}{\text{ton}} \frac{\$}{\text{capital-hr}} = \frac{\$}{\text{ton}} \right]$$

The right-hand-side sum then is the dollars paid to all factors per ton of steel produced. If the payments to factors for each ton produced equal the price per ton then profit must be zero in the industry.

2.2 Factor Price Equalization Theorem

Factor price equalization is an economic theory developed by Samuelson (1948) which assumes there are two goods and two factors of production such as capital and labour. The theory arises out of Heckscher-Ohlin model and is so called the factor-price equalization theorem. Factor price equalization states that when the prices of the output goods are equalized between countries as they move to free trade, then the prices of the factors such as capital and labor also equalized between countries. This implies that free trade equalizes the wages of labour and the rents earned on capital throughout the world (Bhagwati, 1991).

The free trade equalizes factor prices, is referring to a well-defined situation in which all barriers to trade are eliminated. In that special case of free trade, if a number of other assumptions also hold, including that factors are perfectly mobile across the industries and that factor endowments of different countries are sufficiently similar to permit incomplete specialization, then those countries share the same prices of all factors. It is the absence of trade barriers, and not any measure of the volume or terms of trade, that affects factor prices. This is a testable proposition in principle, although the difficulty of finding situations of truly free trade makes it difficult in practice. However, the FPE theorem does not support a movement closer to free trade, if that could be defined, would draw factor prices closer together. It is a theorem about a static equilibrium with perfectly free trade and it is not a comparative static proposition.

3.0 MATERIAL AND METHODS

The paper was merely concentrated on relationship between trade and income while validating the Stolper-Samuelson theorem and Factor Price Equalization Theory to practice and its applicability to solve the unclear relationship between trade and wage/income distribution. The theories in particular have not been fully contributing to cementing the trade and income distribution relationship. In this aspect, published Articles or journals from developed and developing countries were reviewed and analyzed with respect to intention of the paper. The findings from reviewed articles presented in descriptive way.

4.0 RESULTS AND FINDINGS**4.1 Relationship Between Trade and Wage/Income Distribution**

Globalization is the word used to describe the growing interdependence brought about by cross-border trade in goods and services, technology and flows of investment, labour and information. Davis (1992) studied by relates wages directly to trade, but in quite a

different way. It was done across a large number of countries to see whether relative wage structures in those countries have converged or diverged over time. The major finding indicated that relative wages tend to diverge over time. However, after controlling for year-specific effects and allowing for the role of trade as a fraction of GDP. The finding shows that the more open countries in terms of the trade share have converging relative wages. It was concluded that there is existence relationship between trade and wages.

Wood (1994) assumed two factors of production such as skilled and unskilled labor and two countries in developed countries and in developing countries. Each producing two goods that is skilled and unskilled labor-intensive. The related predictions in terms of the distributive consequences of trade openness are well known and have often been invoked to justify trade liberalization in the DCs. Greater openness should increase the relative demand and prices for unskilled labor and lead to a more equal distribution of wages in low-skilled-labor abundant countries.

Rassekh (1993) found that Factor Price Equalization is capable of explaining cross-country variation in industry-level wages for a sample of 11 industries in 14 OECD countries over the period 1970-85. It suggests that diffusion of technology, relative dispersion of production techniques and to a lesser extent international trade at the industry level explain the dispersion of wages across countries. Moreover, it examination of wages and production techniques in 7 industries of the non-traded goods sector indicates that variation in the variables across countries is much less than the variation in the traded goods sector.

4.2 Validity of Stolper Samuelson Theorem

The Stolper-Samuelson theorem is based on the assumptions of Heckscher Ohlin theory of trade. Some of the assumptions of the Heckscher Ohlin theory are very stringent and need to be followed very strictly. Under such situation, the validity of the Stolper-Samuelson theorem is limited to the Heckscher Ohlin trade model only. Stolper Samuelsson theorem explained that, tariff increases the real income of the scarce factor and decreases the real income of the abundant factor is unambiguous within the model (Deardorff, 1994). While it was criticized, Stolper Samuelsson defended on the ground that the two-commodity assumption is not critical or a limiting case. It is often applied to the case of more than two commodities so long as it is possible to classify the commodities as labour-intensive and capital-intensive. It is claimed that the theorem provides the valuable insight into the effect of a tariff on income distribution or wage distribution.

It is also argued that some of assumptions of the Stolper Samuelsson are too strong to retain its validity as a general case. Even in minor change in condition specified by assumptions may render the theorem questionable. Stolper Samuelson assumes tariff does not change in terms of trade where under normal condition, tariff is supposed to improve the terms of trade. If the improvement in the term of trade equal to tariff, then Stolper Samuelsson theorem may hold but if the improvement in the term of trade exceed tariff, then Stolper Samuelsson theorem may not hold.

4.3 Validity of Factor Price Equalization Theorem

The factor price equalization theorem holds in the HO model because of certain assumptions. Specifically, the assumption of identical production techniques leads to the result that workers everywhere will have the exactly the same productivity. When trade begins, there will be only one price for the good. Hence, these equally productive workers will earn identical wages (because the wage equals the value of the worker's marginal product). In reality, workers in different countries have very different productivities and receive different wages according to those productivities. Labor in the United States is more productive than labor in Mexico and receives a correspondingly higher wage (Edwards, 1997).

In practice, one does not typically see factor price equalization, or indeed anything close to it. The 1992 North American Free Trade Agreement between Mexico, Canada and the United States, did not fully equalize wages across the United States and Canada, much less between Mexico and the United States (Hanson and Harrison, 1999). For example Mexico is still a young state where the rule of law is progressively strengthening, different levels of technology and other factors still drive a wedge that keeps Mexican wages far below United States levels. Despite the fact that there are large immigration flows going on at the same time. One assumption of Samuelson's analysis that is perhaps strained in practice is that labor and capital are perfectly mobile across sectors. In practice, workers often require extensive retraining or relocation and a great deal of capital is industry specific. Nevertheless, the result gives a critical benchmark for illustrating the extraordinary importance and power of free trade. All in all, Samuelson's results still guide the trade debate and the results still provide the benchmark for the succeeding literature.

5.0 CONCLUSION AND RECOMMENDATION

The intention of the paper was assessing the relationship between trade and wage/income distribution while validating the Stolper Samuelson and price factor theorem in practice. The review noted contradicting discussion on relationship between trade and wage

or income distribution. Moreover, theoretical results of more than two factors suggest that the determination of wages is not as simple as considered by Stolper-Samuelson theorem. The wages and other factor prices depend not only on trade per se but on prices of goods. This in turn may be determined primarily in world markets, depending on the size of the country and under special additional assumptions. These may even vary systematically with the quantities of trade. However, no general and direct relationship between the volume of trade and wages that holds in any general-equilibrium theory of trade. Furthermore, various models relate wages to prices of goods rather than to trade. It is recommended that comprehensive reviews of studies should be done to explore the relationship between wage and trade.

REFERENCE

- Bhagwati, J (1991). "Trade and Income Distribution" Paper presented at the Columbia University conference on deindustrialization, New York, N.Y., 15-16,
- Bound, John, and George Johnson (1991). "Wages in the United States during the 1980s and Beyond." In Marvin H. Kosters, ed., *Workers and Their Wages: Changing Patterns in the United States*. Washington, D.C
- Bourguignon, F., Morrisson, C (1990). "Income distribution, development and foreign trade", *European Economic Review*, Vol. 34, pp. 1113-1132.
- Calderón, C. and Chong, A (2001): "External sector and income inequality in interdependent economies using a dynamic panel data approach", *Economics Letters*, Vol. 71(2), pp. 225-231
- Davis, Steven J (1992) "Cross-Country Patterns of Change in Relative Wages." In Olivier, J. Blanchard and Stanley Fischer, eds., *Macroeconomic Annual*. Cambridge, Mass.: MIT Press
- Deardorff, A (1994) "Overview of the Stolper-Samuelson Theorem" in Deardorff, A. and Stern, R. (eds). *The Stolper-Samuelson Theorem: A Golden Jubilee* University of Michigan Press, Ann Arbor, pp. 7-34.
- Dollar, D and Kraay, A (2004). "Trade, Growth, and Poverty", *The Economic Journal*, Vol. 114 (493), pp. F22-F49. Brookings Institute Press, pp. 141-202.
- Edwards, S (1997). "Trade Policy, Growth, and Income Distribution", *The American Economic Review*, Vol. 87 (2), Papers and Proceedings of the Hundred and Fourth Annual Meeting of the American Economic Association; pp. 205-210.
- Feenstra, Robert and Gordon, Hanson (1996), "Globalization, Outsourcing, and Wage Inequality" *American Economic Review*, 86:2
- Hanson, G and Harrison, A (1999). "Trade and wage inequality in Mexico," *Industrial and Labor Relations Review*, Vol. 52(2), pp. 271-288
- Lawrence, R. and Slaughter, M (1993) "International Trade and American Wages in the 1980s: Giant Sucking Sound or Small Hiccup?" *Brookings Papers: Microeconomics* 2, pp. 161-226.
- Leamer, E (1998) "In Search of Stolper-Samuelson Linkages between Trade and Lower Wages" in Collins, S. (ed.) *Imports, Exports, and the American Worker* Brookings Institute Press, pp. 141-202.
- Leamer, E (1998). "In Search of Stolper-Samuelson Linkages between Trade and Lower Wages" in Collins, S. (ed.) *Imports, Exports, and the American Worker* Wood, A (1994). "North-South trade, employment, and inequality: Changing fortunes in a skill-driven world", Clarendon Press, Oxford.
- Li, H., Squire, L. and Zou, H. (1998). "Explaining International and Intertemporal Variation in Income Inequality", *The Economic Journal*, Vol. 108, pp. 26-43.
- Magee, S. (1980). "Three Simple Tests of the Stolper-Samuelson Theorem" as found in Deardorff, A. and Stern, R. (eds.) *The Stolper-Samuelson theorem: A golden jubilee. Studies in International Trade Policy*. Ann Arbor: University of Michigan Press, 1994, pp. 185-200.
- Rassekh, Farhad (1992), "The Role of international Trade in the Convergence of Per Capita GDP in the OECD. 1950-1985," *International Economic Journal* 6; pp. 1-15.
- Rassekh, Farhad (1993). *International trade and Relative Dispersion of Industrial Wages and Production Techniques in 14 OECD Countries. 1970-1985, forthcoming in Open Economies Review*.
- Robbins, D (1995) "Trade, Trade Liberalization, and Inequality in Latin America and East Asia: Synthesis of Seven Country Studies," Harvard Institute for International Development, Cambridge, Mass. Processed.
- Robertson, R. (1999) "Inter-industry Wage Differentials Across Time, Borders and Trade Regimes: Evidence from the US and Mexico" mimeo, Syracuse University.